WHAT IS CLAIMED IS:

1. An instrument for determining characteristics of a target material, comprising:

an outer housing;

an inner core that is rotatably mounted within the outer housing;

a plurality of interrogation devices mounted on the inner core in a predetermined pattern; and

a detent mechanism attached to the inner core, wherein the detent mechanism is configured to allow the inner core to be rotated between a plurality of predetermined rotational positions relative to the outer housing.

2. The instrument of claim 1, wherein the plurality of interrogation devices are mounted on the inner core so that when the inner core is positioned at a first predetermined rotational position, the interrogation devices are positioned adjacent a first plurality interrogation positions relative to the outer housing, and wherein rotation of the inner core from the first predetermined rotational position to a second predetermined rotational position causes the plurality of interrogation devices to be repositioned adjacent a second plurality of interrogation positions.

3. The instrument of claim 2, wherein the instrument is configured such that the plurality of interrogation devices are repositioned to a plurality of predetermined interrogation positions each time the inner core is rotated to a corresponding predetermined rotational position.

4. The instrument of claim 3, wherein none of the predetermined interrogation positions are coincident.

5. The instrument of claim 1, wherein the predetermined pattern in which the plurality of interrogation devices are mounted on the inner core minimizes cross-talk between adjacent interrogation devices.

Although the presently preferred embodiments utilize rotating devices to accomplish a plurality of measurements on a target tissue, alternate embodiments could use some other movement mechanism other than a rotating one. The invention encompasses other types of movement or translational devices that allow a plurality of measurements to be taken on a target tissue with a limited number of detectors that are spaced far enough apart to avoid cross-talk.

The foregoing embodiments are merely exemplary and are not to be construed as limiting the present invention. The present teaching can be readily applied to other types of apparatuses. The description of the present invention is intended to be illustrative, and not to limit the scope of the claims. Many alternatives, modifications, and variations will be apparent to those skilled in the art.

6. The instrument of claim 1, wherein sensing portions of the plurality of interrogation devices are mounted on a face of the inner core, and wherein the predetermined pattern in which the plurality of interrogation devices are mounted on the inner core distributes the plurality of interrogation devices substantially evenly across the face of the inner core.

7. The instrument of claim 1, wherein the plurality of interrogation devices comprise a plurality of optical fibers.

8. The instrument of claim 7, wherein at least two optical fibers are located at each interrogation position, wherein at least one optical fiber at each interrogation position is configured to conduct excitation light to the interrogation position, and wherein at least one optical fiber at each interrogation position is configured to receive light that is scattered from or generated by a target material.

9. The instrument of claim 7, further comprising a detector array, wherein light scattered from or generated by a target material is conducted to the detector array by at least some of the optical fibers.

10. The instrument of claim 1, wherein stops are formed on an inner surface of the outer housing, and wherein the detent mechanism comprises at least one detent mount that is attached to the inner core and that is configured to interact with the stops to hold the inner core in the plurality of predetermined rotational positions.

11. The instrument of claim 10, wherein each stop includes a depression, wherein each at least one detent mount includes a biased member, and wherein each biased member is configured to nest in a depression of a stop to hold the inner core in one of the plurality of predetermined rotational positions.

12. The instrument of claim 1, wherein the detent mechanism is configured to support at least a portion of the inner core inside the outer housing.

13. The instrument of claim 1, wherein the outer housing includes an end cap, and wherein the plurality of interrogation devices are configured to project excitation light through the end cap and to detect light from a target material that passes through the end cap.

14. The instrument of claim 13, wherein an index matching agent is located between the end cap and the plurality of interrogation devices.

15. The instrument of claim 14, wherein the index matching agent also acts as a lubricant to allow the inner core to rotate freely within the outer housing.

16. An instrument for determining characteristics of a target material, comprising:

an outer housing;

means for determining characteristics of a target material at a plurality of predetermined interrogation locations arranged in a predetermined pattern; and

means for holding the determining means in a plurality of predetermined positions relative to the outer housing.

17. The instrument of claim 16, wherein the device is configured such that moving the determining means between the plurality of predetermined positions allows the determining means to determine characteristics of a target material at a plurality of interrogations locations, and wherein none of the interrogation locations are coincident.

18. The instrument of claim 16, wherein the predetermined pattern minimizes cross-talk between adjacent interrogation locations.

19. The instrument of claim 16, wherein the outer housing includes an end cap, and wherein the interrogation locations are substantially evenly distributed across the end cap.

20. A method of detecting characteristics of a target material, comprising the steps of:

positioning a plurality of interrogation devices that are arranged in a pattern adjacent a first plurality of interrogation positions on a target material;

detecting characteristics of the target material at the first plurality of interrogation positions;

repositioning the plurality of interrogation devices so that they are adjacent at least one additional plurality of interrogation positions on the target material, wherein the first and at least one additional plurality of positions are not coincident; and

detecting characteristics of the target material at the at least one additional plurality of interrogation positions.

21. The method of claim 20, wherein the repositioning step comprises rotating the plurality of interrogation devices around a common axis.

22. The method of claim 20, wherein each detecting step comprises the steps of:

detecting a first type of characteristics of the target material at a plurality of interrogation positions; and

detecting a second type of characteristics of the target material at a plurality of interrogation positions.

23. The method of claim 22, wherein the first type of characteristics comprise scattering characteristics, and wherein the second type of characteristics comprise fluorescent characteristics.